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Cost-effectiveness of guideline-based care for workers with mental health problems

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ABSTRACT

Objective

To evaluate the cost-effectiveness of an activating guideline-based care by occupational physicians (OPs).

Methods

An economic evaluation was conducted in a randomized controlled trial with police workers on sick leave due to mental health problems (n=240). In the intervention group trained OPs provided guideline-based care, compared to usual care with easy access to a psychologist. Sick leave data and health care costs were gathered after one-year follow-up. Analyses comprised bootstrap techniques, cost-effectiveness planes and acceptability curves.

Results

Health care utilization costs (€574.532 in total) were significantly lower in the intervention group (mean difference -€520; 95% CI: -€980, -€59), while there were no significant differences in days of sick leave and productivity loss costs.

Conclusions

Guideline-based care could be cost-effective, as lower direct costs lead to equal treatment outcomes of workers with common mental disorders.

Trial registration

www.controlled-trials.com; Identifier: ISRCTN34887348.

INTRODUCTION

High social and economic costs of poor mental health have led to growing recognition of the need to develop effective interventions, especially in primary and occupational health care (1,2). Across the U.S.A. and the European Union evidence has grown that mental health problems increasingly lead to sick leave, early retirement and productivity loss (3-5). In the Netherlands, one-third of all long-term sick leave or work disability cases are attributable to common mental health problems (6,7). Although several trials have been conducted on the clinical effectiveness of interventions on mental health problems, economic evaluations are scarce and results hardly usable in mental health policy (8,9).

In the Netherlands, the first points of contact for workers with mental health problems, are the general practitioner (GP) and the occupational physician (OP) (10). However, both GPs and OPs often lack time and skills to optimally deal with these workers, resulting in a minimal approach (11,12). When after a few weeks complaints persist, GPs and OPs often refer workers to psychologists. This 'referral delay' is often associated with delayed return to work. In addition, specialized mental health care usually focus on symptoms instead of work, which may hinder early return to work (12-14). Consequently, workers may not get the optimal care they need, and productivity loss and treatment costs may be higher than necessary.

As an alternative to usual care, the Netherlands Society of Occupational Medicine (NVAB) has published a guideline on 'The management by OPs of workers with mental health problems' in 2000 (15,16). This guideline promotes a more active role of the OP as counselor facilitating return to work of the worker. This intervention appeared to be effective in an in-company setting in fastening RTW for workers with adjustment disorders, if compared to a passive UC (17).

To evaluate the effectiveness of guideline-based care (GBC) by OPs compared to usual care (UC) for a broad range of workers with common mental health problems, a randomized controlled trial with a 12-month follow-up was conducted in an occupational health care setting (18). GBC was not more effective than UC in reducing productivity loss, but may result in economic benefits. The objective of this study was to conduct an economic evaluation of GBC in reducing productivity loss costs, from both a societal and a company perspective, compared to UC. The hypothesis was that a reduction in health care utilization could be achieved, as a consequence of GBC with fewer referrals to psychologists and increased self-management, compared to UC.

METHODS

Design and hypothesis

An economic evaluation from a societal and a company perspective was conducted within a randomized controlled trial. Subjects in the intervention group received guideline-based care (GBC) by OPs. The control group received usual care (UC), with minimal involvement of the OP and easy access to a psychologist. The study was funded by the Dutch Ministry of Internal Affairs and Kingdom Relations, and the Health Insurance of the Dutch police (DGVP). The study design, protocol and procedures were approved by the Medical Ethics Review Committee of the VU University Medical Center. Details of the study design and the guideline have been reported elsewhere more extensively, but a brief summary will be presented below (18).

Study population

This randomized controlled trial was conducted with the cooperation of two departments of the Dutch police force, comprising a source population of 2500 police workers. The Dutch police force is an organization with a relatively high incidence of stress-related sick leave (19). Recruitment of police workers on sick leave due to common mental disorders started in 2002. Police workers were included by the OP when they visited the occupational health service (OHS).

Randomization and blinding

Randomization into two groups was achieved by random number generation, balancing after every 50 participants. Participants, employers and OPs were not blinded for the intervention. The researchers were blinded for both the treatment allocation and protocol compliance.

Usual care

UC consisted of minimal involvement of the OP and easy access to counseling by a psychologist. Counseling was fully funded by the health insurance company of the police (DGVP).

Intervention

GBC in the intervention group consisted of treatment by OPs according to the NVAB guideline of workers with mental health problems (18). Before the study started, OPs participated in a three-day course. The course focused on an early start of the intervention by OPs, in which they operate as an activating counselor using cognitive behavioral elements aiming to enhance the problem-solving capacity of workers, especially in relation to their work environment (17).

Economic evaluation

An economic evaluation was performed from both societal and employers' perspectives (20). From a societal perspective, a cost-effectiveness analysis (CEA) was conducted combining differences in costs of the intervention and other health care, with days of sick leave until full return to work. Additionally, a cost-benefit analysis (CBA) from the perspective of the employer was performed to compare the costs of the intervention and other health care with the monetary benefits of reduced productivity loss.

Health care costs

Health care costs of participants were collected over a 12-month period, starting from the date of inclusion. As mental health problems may affect physical functioning in addition to mental functioning, all health care related costs were collected during follow-up. Healthcare costs related to the use of primary, psychological and hospital care were extracted from the computerized records of the insurance company of the Dutch police force (DGVP). Data on the use of occupational healthcare were extracted from the computerized medical records of the OHSs of the police departments. The costs associated with occupational health care were based on the contract tariffs of the OHSs and costs found in the literature (21,22). Costs related to counseling by 'private' psychologists and social workers were estimated and valued using cost prices recommended in the Dutch manual for costing (23-25). The cost index of 2003 was used. The training costs of the OPs in GBC were determined bottom-up and compared to the real costs of the training (supplement 1). This resulted in an average training cost of € 40 per participant for the GBC group. Healthcare costs from the perspective of the employer

COST-EFFECTIVENESS

comprised the costs of occupational health care and psychological care paid by the employer and DGVP.

Productivity loss

The primary outcome measure described in this study was sick leave, which is used as a proxy measure of productivity loss. The cumulative number of sick leave days during the one year follow-up was used in the CEA. Sick leave was defined as the duration in calendar days of work absence to partial or full return to work in own or equal earnings, preceded and followed by a period of at least 1 day at work (26,27). The outcome was expressed in two ways: gross and net sick leave (22). Gross sick leave was defined as the total number of calendar days that subjects were completely or partially on sick leave. In cases of net sick leave, it was assumed that subjects were productive during the hours of partial sick leave. Sick leave data were gathered from records of the police departments after one year follow-up, which is more accurate than from self-report (28).

Costs associated with productivity loss were estimated from a company perspective by both the Friction Cost Method (FCM) and Human Capital Approach (HCA) (20,24). According to the FCM, productivity losses are limited to the time needed to restore production back to its initial level. This means that the Friction Cost Period is the estimated time it takes a company to find replacement of the sick worker (7,24). Productivity loss costs according to the FCM were estimated by multiplying an average daily wage by the gross number of sick leave days, up to a standard Friction Cost Period maximum of 154 days (24). Productivity loss costs according to the HCA were estimated by multiplying an average daily wage by the total gross number of sick leave, using the entire period of sick leave.

Baseline measures

Data regarding personal, treatment and work characteristics were gathered from the records of the police departments and of the medical files of the OHSs. Severity of depression, anxiety and stress were measured at baseline using the Depression Anxiety Stress Scales (DASS-42) and the Hospital Anxiety Depression Scale (HADS) (29-32).

Data analysis

The economic evaluation was performed according to the intention-to-treat principle. No imputation was done, as less than 10% of the study population was lost to follow-up and as lost to follow-up data were equally spread over both groups. For all analyses 95% confidence intervals (CIs) of the difference in mean costs in both groups were computed by bias corrected and accelerated (Bca) bootstrapping with 2000 replications (33).

From a societal perspective, a cost effectiveness analysis (CEA) was conducted. To assess the cost-effectiveness of GBC, the difference in mean costs (ΔC : incremental costs) between the groups was divided by the difference in mean effects (ΔE : incremental effects). In the CEA ΔC included the difference in the total direct healthcare costs, which was divided by ΔE with net sick leave as effect measure. To avoid double-counting, productivity loss costs due to sick leave were not included in the costs, as the difference in sick leave was the effect measure.

From the company perspective a cost benefit analysis (CBA) was performed, using the net benefit framework (34). The mean net monetary benefit (NMB) of GBC compared with UC was estimated, using the following equation: $NMB = \Delta E * \lambda - \Delta C > 0$ (34). ΔE was the mean difference in total net sick leave days between GBC and UC, using the Human Capital approach. ΔC was the mean difference in direct healthcare costs for the company.

COST-EFFECTIVENESS

Lambda (λ) represented the mean salary per day of our population, based on a 36 hours working week per person.

For both CEA and CBA, the 95% CIs around the incremental cost-effectiveness ratios (ICERs) and the NMB were computed by a Bca-bootstrapping procedure with 5000 replications (33). Uncertainty around the pooled mean ICERs and NMB was estimated by 95% confidence intervals, using Brigg's model (35). Bootstrapped cost-effect pairs were plotted on a cost-effectiveness plane and acceptability curves were generated (36).

Sensitivity analysis

The effect of partial return to work on productivity was determined with a sensitivity analysis on the CEA. Therefore, the CEA was repeated with the same ΔC , but a different ΔE . Under the assumption that workers who partially resumed work were completely productive (instead of partially productive), ΔC was divided by ΔE with gross sick leave as effect measure.

To assess the robustness of the CBA, two additional sensitivity analyses were conducted. First, an estimation was made of the impact of using total costs that contained productivity loss costs calculated by the FCM, instead of the HCA. Second, the CBA was performed with another λ representing the society's maximum willingness-to-pay for a day less of sick leave (37). This new λ was selected to be € 255, which equals the Dutch average cost price for a day of work (24), and replaced the mean salary per day of our study population.

RESULTS

Participants

Between January 2002 and January 2005, 489 workers were registered by the OHS as being absent from work due to mental health problems (figure 1). Of those, 240 signed an informed consent and were randomized. A total of 125 subjects was assigned to GBC and 115 to UC. Baseline data are presented in table 1. There were no significant differences in participant characteristics between the groups. In total, 16 subjects were lost to follow up; 15 because they left the police force during follow-up and one because of death. Mean salary per day was € 125.

Health care costs

The mean costs of health care utilization and productivity loss are presented in table 2 with standard deviations (SD) per group and mean cost differences, in Euros, over the 12-month follow-up, based on complete cases. Resource use and valuation are shown in supplements 2 and 3. Main cost driver is psychological care, followed by primary care, occupational health care, and hospital care. Total health care costs were significantly higher in UC compared to GBC. The mean costs of psychological care were less in GBC, while the mean costs associated with occupational health care were lower in the UC. This was mainly caused by the intervention training costs of OPs and a higher utilization rate of guidance by a company social worker. Mean costs of primary care were higher in GBC, as there was a higher utilization rate of medication and multidisciplinary physical therapy.

Health care costs from the employers' perspective were significantly higher in UC compared to GBC, due to higher costs of psychological care.

COST-EFFECTIVENESS

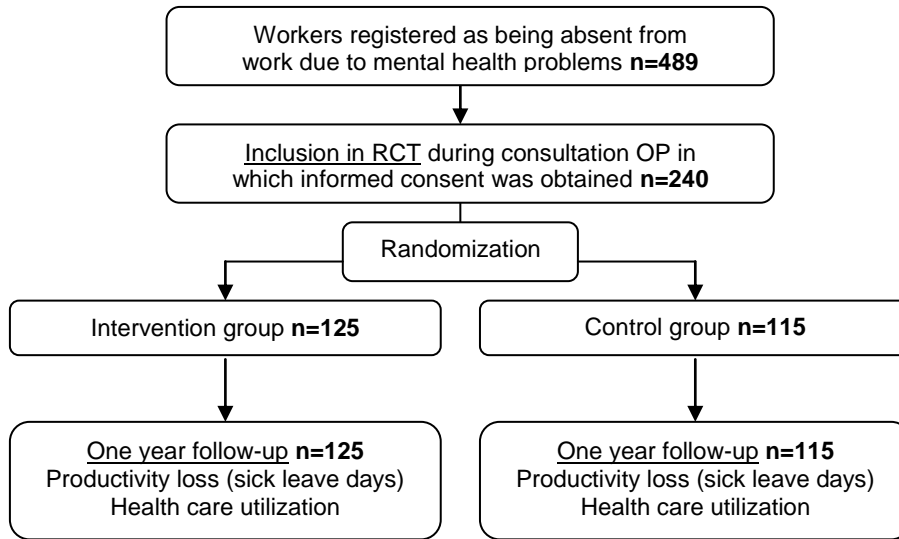


Figure 1 Flow chart CO-OP study

Table 1 Characteristics of the study population

Patient characteristics	GBC (n=125)	UC (n=115)
Age in years, mean (sd)	38.8 (8.4)	40.0 (9.5)
Gender (% male)	51.2	60.5
Children (%)	66.4	63.2
Married or cohabiting (%)	66.4	68.4
Work related characteristics		
Police department (% PHM)	70.4	64.0
Mean contract hours a week, mean (sd)	33.6 (6.2)	34.1 (6.0)
Executive work (%)	59.2	65.8
Irregular work (%)	59.2	62.5
Work relatedness mental health disorder (%)	48.8	44.7
Absenteeism previous year		
Days of sick leave in previous year, mean (sd)	56.9 (61.4)	56.1 (86.1)
Severity of disorder (symptoms HADS/DASS)	n=112	n=101
HADS-Anxiety, mean (sd)	11.4 (3.8)	11.4 (3.8)
HADS-Depression, mean (sd)	11.5 (4.4)	11.8 (4.5)
DASS-Stress, mean (sd)	9.2 (7.3)	9.0 (6.8)
DASS-Anxiety, mean (sd)	4.16 (5.5)	3.9 (5.2)
DASS-Depression, mean (sd)	6.9 (7.4)	6.6 (7.4)
Depression and/or Anxiety based on DASS (%)*	34.8	29.0

* Cut-off scores (36): >12 on symptoms depression and >5 on symptoms of anxiety

COST-EFFECTIVENESS

Table 2 Total and mean component costs

Component costs of resource use	Total costs	Mean costs (\$D)		Mean cost difference (95% CI)
		GBC (N = 125)	UC (N = 115)	
Primary care	173692	810 (1253)	630 (814)	180 (-88; 410)
General practitioner	31068	127 (123)	132 (130)	-5 (-35; 26)
Diagnostic tests	20862	83 (184)	91 (199)	-8 (-52; 44)
Medications	56806	249 (677)	223 (382)	26 (-103; 153)
Allied health professionals	23079	93 (176)	99 (213)	-6 (-57; 47)
Multidisciplinary therapy	41878	258 (880)	84 (461)	173 (-5; 313)
Occupational health care	124900	552 (280)	486 (277)	66 (2; 151)
Occupational physician	73500	310 (198)	303 (196)	7 (-47; 53)
Intervention training costs	5000	40 (-)	--	-40 (- ; -)
Case manager	19472	81 (79)	81(73)	-1 (-20; 18)
Company social worker	26928	122 (136)	102 (132)	20 (-14; 55)
Psychological treatment	208654	534 (929)	1233 (846)	-698 (-987; -420)
Psychologist (paid by employer)	196870	463 (903)	1208 (848)	-745 (-1027; -461)
Psychologist (paid by community)	11784	72 (228)	25 (135)	47 (-4; 88)
Hospital	67286	248 (841)	316 (1011)	-68 (-283; 188)
Total health care costs	574532	2145 (2037)	2664 (1592)	- 520 (-980; 17)
Productivity loss gross HCA †	4442152	18801 (12112)	18192 (12797)	609 (-2579; 3638)
Productivity loss net HCA †	3397555	14114 (10306)	14202 (10890)	-88 (-3020; 2404)
Productivity loss net FCM *	2784249	11691 (6448)	11503 (6472)	188 (-1402; 1987)

† HCA = Human Capital Approach

* FCM = Friction Cost Method

Productivity loss

No significant differences between the groups were found in mean sick leave days between the groups: Net sick leave HCA (GBC: 113 (Standard deviation (SD) = 83); UC: 114 (SD = 87)); Gross sick leave HCA (GBC: 151 (SD = 97); UC: 146 (SD = 103)). Productivity loss costs were found to be, depending on the way they were measured, 6 to 9 times higher than the total health care costs. No significant differences were found between the groups for any of the four aggregated total costs associated with productivity loss.

Cost-effectiveness and cost-benefit analyses

Table 3 shows the cost and effect differences and incremental cost and effect ratios (ICERs) from the main cost-effect analysis (CEA) and corresponding sensitivity analysis (SA1), and from the main cost-benefit analysis (CBA) and corresponding sensitivity analyses (SA2, SA3). The cost-effectiveness plane (CE-plane) from the main CEA is shown in Figure 2 representing the uncertainty around the ICER for the mean difference in total costs divided by the mean difference in net sick leave (HCA) for the total group. The ICER was -736, meaning that the costs of GBC were lower (table 3). Figure 3 shows that regardless the amount one is willing to pay per day of sick leave, the probability that the intervention was cost-effective did not exceed 50%.

COST-EFFECTIVENESS

Results of the cost-benefit analyses showed that the mean cost difference was still in favor of GBC, although the difference between both groups became smaller. According to the CBA, the estimated NMB of GBC in terms of reducing productivity loss costs, for the measured mean salary per day (λ) of € 125, was € 3,582.

Sensitivity analyses

The results of the CEA sensitivity analysis involving gross sick leave (SA 1) showed that the mean effect difference became negative, causing a reversal of the direction of the mean ICER from quadrant II into quadrant III (table 3). The first sensitivity analysis of the CBA involving productivity loss measured by FCM (SA 2) indicated that there was a reversal in the direction of the mean effect difference but no change in mean difference in treatment costs, whereby a shift in the mean ICER from quadrant II to III occurred. The second sensitivity analyses of the CBA (SA3) with a different mean salary per day (λ) showed a positive effect again, as this was measured by the HCA approach. With respect to the CEA and the CBA analyses, the results based on the alternative calculation of sick leave days and productivity loss costs changed the mean effect differences from positive to negative. As these mean effect differences remained small, while the mean cost differences stayed significant in benefit of the intervention, the overall results were similar to the main analyses.

Table 3 Mean cost and effect differences (ΔC and ΔE), incremental cost-effect ratios (ICERs), and CE-plane distributions

Analysis	N		ΔC (95% CI)	ΔE (95% CI)	ICER	Distribution CE-plane			
	CEA	GBC UC	Euros	Days		I [†]	II [‡]	III [§]	IV [*]
Main (net)	125	115	-520(-980; -59)	1(-21;22)	-736	1%	52%	46%	0%
SA1 (gross)	125	115	-520(-980; -59)	-5 (-40; 30)	106	0%	28%	70%	2%
	CBA		Euros	Euros					
Main (HCA)	125	115	-219 (-385; -54)	88 (-2600; 2776)	-2.49	1%	53%	6%	0%
SA2 (FCM)	125	115	-219 (-385; -54)	-188 (-1824; 1449)	1.17	0%	36%	64%	1%
SA3		125 115	-219 (-385; -54)	174 (-5124; 5471)	-1.26	1%	53%	64%	0%

* In the CEA analysis, ΔE = mean difference in sick leave days 'net' calculated under the assumption that subjects who partially resume work during a sick leave period are 100% productive during those hours, ΔC = mean difference in total treatment costs; in SA1, ΔE = mean difference in sick leave days 'gross' calculated under an alternative assumption that subjects who partially resume work are completely unproductive during those hours. In the CBA analysis, ΔE = mean difference in productivity loss costs (based on sick leave days 'net') estimated by the HCA, ΔC = mean difference in total costs from the employer's perspective; in SA2, ΔE = mean difference in productivity loss costs ('based on sick leave days 'net') estimated by the FCM; in SA3, ΔE = mean difference in productivity loss costs ('based on sick leave days 'net') estimated by the HCA with $NMB = \lambda * \Delta E - \Delta C$, where $\lambda = € 255$.

[†] Refers to the northeast quadrant of the CE-plane, which indicates that the intervention is more effective and more costly than UC.

[‡] Refers to the southeast quadrant of the CE-plane, which indicates that the intervention is more effective and less costly than UC.

[§] Refers to the southwest quadrant of the CE-plane, which indicates that the intervention is less effective and less costly than UC.

** Refers to the northwest quadrant of the CE-plane, which indicates that the intervention is less effective and more costly than UC.

COST-EFFECTIVENESS

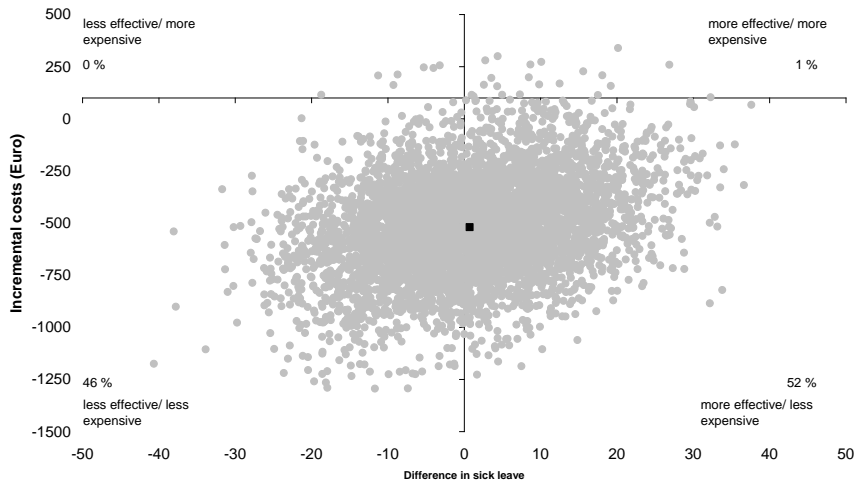


Figure 2 Cost-effectiveness plane

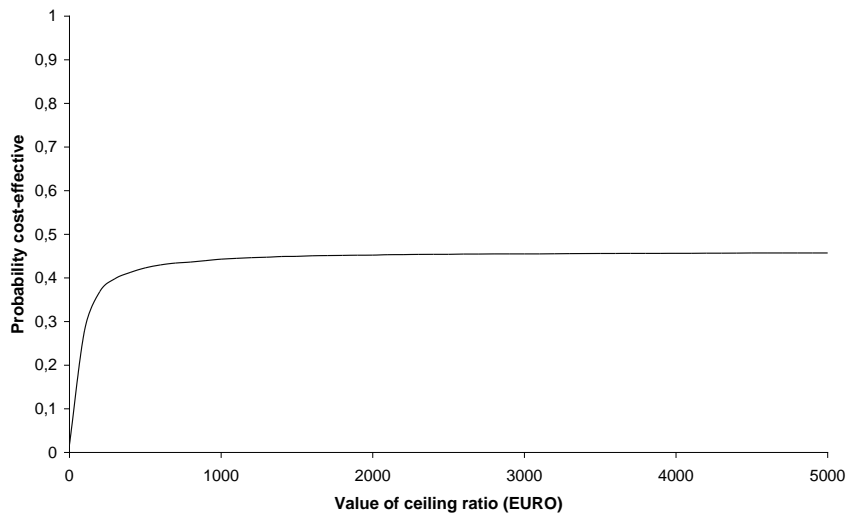


Figure 3 Cost-effectiveness acceptability curve of the CEA (net sick leave HCA)

DISCUSSION

Interpretations

From an economical point of view, activating counseling of workers with common mental health problems by OPs using guideline based care (GBC) may be preferable to usual care (UC) with easy access to a psychologist. These results suggest that society, especially

employers, would experience a positive return on investment from a minimal, evidence-based, intervention in occupational healthcare.

In this pragmatic trial, effectiveness instead of efficacy has been studied. The pragmatic study design with broad inclusion criteria allowed variation in context, diagnosis and treatment. As this was reflective of clinical practice in the occupational health care setting, external validity of our results was enhanced. However, caution is advised because these findings may be attributable to our study population, unrealistic contrast between the treatment groups or methodological issues.

Study population

The guideline is mainly based on evidence of a study showing effect on adjustment disorders (17). Therefore, the aim of the guideline is to activate the OP especially for this subgroup. However, the study population, e.g. Dutch police workers, has a higher risk of getting into stressful situations than many other workers (19). This is caused by a relatively high workload and emotional pressure, and to a certain extent this reflects that police workers have other occupational risks than the general working population. As the study population will not be fully representative of the general working population, external validity of study results may be limited and caution has to be taken in generalizing the results.

Contrast between the groups

As randomization was done at the individual level, OPs who were trained in the guideline treated the participants of the intervention and control group. Obviously, this situation created a risk of treatment contamination between the groups. However, we tried to maximize the contrast by creating a situation in which referral to the psychologist in UC was always granted by the health insurance company (DGVP). These psychologists may not have been fully representative for UC as they were member of a multidisciplinary rehabilitation center with a focus on return to work.

Attribution of the cost effectiveness of GBC to the intervention is questionable. Although referral patterns to psychological care in our treatment groups differ significantly, treatment in the GBC by OPs did not differ from UC in terms of consultations with workers, employers and curative care. In GBC there were more referrals to company social workers, in UC there were more referrals to psychologists. These results point out that the training provided to the OPs may not have led to another treatment pattern, compared to UC. The training may have been insufficient for learning of GBC, or may have resulted in GBC in UC as well.

Methodological considerations

Results of this study may have been influenced by three methodical issues. First, incremental costs by training OPs in the GBC group appeared to be lower than the costs of referrals to the psychologist in UC. Training costs were hard to assess, but will not have been much higher, as these costs reflect a minimal intervention. Costs of referrals to psychologists in UC may have been an overestimation if compared to real circumstances, as referral patterns were higher than 'usual' and psychological care by the participating provider was rather expensive. This may have resulted in lower costs of the GBC compared to UC.

Second, data from patient and family health care costs were not included. This may have led to an over- or underestimation of the total health care costs. As these costs are regarded to contain only a small part of the total costs (7), bias of our overall findings is not likely.

COST-EFFECTIVENESS

Third, by using sick leave days as proxy for productivity loss, we did not take into account effects on presenteeism. Mental health problems can influence these aspects of work productivity, as work performance may be suboptimal before and after periods of sick leave (38-41). GBC and UC may have had a differential effect on these aspects of productivity loss. As this may have biased our findings, future research should focus on such productivity measures as well.

Overall evidence

Economic evaluations on the cost-effectiveness of interventions on mental health problems, are scarce, especially cost-benefit analyses (8,9). Most economic evaluations on common mental disorders have been conducted alongside trials in primary care settings and do not seem promising (42,43). An activating intervention by social workers compared to UC by GPs in primary care patients with minor mental disorders on sick leave, was not cost-effective compared with GP routine care (25). A recent study found that a minimal intervention for workers with stress-related sick leave was not associated with superior clinical or economic impact than usual GP care (7,44). Although some types of healthcare utilization may be reduced, counseling in a primary setting does not seem to reduce overall healthcare costs compared to regular GP care (45,46).

Although guideline-based depression care has proven to be effective, employers have been slow to adopt evidence-based recommendations as they lack evidence for cost-effectiveness from their perspective (45). Wang *et al.* (39) developed and evaluated a systematic program to identify depression on the work floor and promote effective treatment of depression by providing psychotherapy. The program appeared to improve not only clinical, but also work productivity outcomes. In occupational healthcare, economic evaluations are a new challenge, and are conducted increasingly alongside trials (47-49). Until now, occupational healthcare interventions have been focusing on physical problems as low back pain (21,22,50). Recently, Schene *et al.* (51) showed that addition of occupational therapy to good clinical practice improves productivity without increasing work stress and is superior to usual care in terms of cost-effectiveness. Additionally, Taimela *et al.* (52) showed that an occupational health intervention for workers with high risk of sickness absence is a cost effective use of healthcare resources. These results confirm our findings that a minimal intervention in an occupational health care setting, in contrast to a primary care setting, has more potential to be cost-effective by enhancing productivity. This is the first randomized controlled trial that proves that guideline-based care of workers with mental health problems could be cost-effective in an occupational health care setting. Further research should focus on the development of cost-conscious guidelines and improving the efficiency of implementation strategies, including monitoring, of guideline-based care (53-56).

Conclusion

Guideline-based care of workers with common mental disorders by an OP proves to be economically in favor compared to usual care with easy access to a psychologist, as lower direct costs lead to equal treatment outcomes. These results suggest that from both society and employers perspective, guideline-based care in an occupational health care setting could be cost-effective.

ABBREVIATIONS

Bca = Bias corrected and accelerated bootstrapping
CI = Confidence Interval CBA = Cost-benefit analysis
CEA = Cost-effectiveness analysis
CE-plane = Cost-effectiveness plane
DASS = Depression Anxiety Stress Scale
DGVP = Health insurance company of the Dutch police force
GP = General practitioner
HADS = Hospital Anxiety Depression Scale
GBC = Guideline-based care
ICER = Incremental cost-effectiveness ratio
NMB = Net monetary benefit
NVAB = Netherlands Society of Occupational Medicine
OHS = Occupational Health Service
OP = Occupational Physician
SD = Standard Deviation
UC = Usual care

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COST-EFFECTIVENESS

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SUPPLEMENTS

Supplement 1 Overview bottom-up calculation training costs GBC

Resources	Description	Aggregated costs
Trainer costs	Two trainers for all three training days, including preparation. 3 (days) x 6 (hours) at € 140 per hour = € 2540 preparation is 0,5 x € 2540 = € 1220 total = € 2540 + € 1220 = € 3760 x 2 = 75200	€ 7,500.00
Administration	Time invested in training of each OP	€ 1,000.00
Room/equipment/ refreshment costs	For rental of meeting room at NSPOH Amsterdam. Equipment includes projector, screen & flip board. Refreshments breaks.	€ 1,250.00
Study material 5 OPs	Binder, dividers & 75 printed pages	€ 230.00
Total training costs for 10 OPs		€ 10,000.00*
Average cost per intervention subject (total training costs/125)		€ 40.00

* Training cost components were staff, administration, room, catering and study materials, totaling a cost price of € 10,000.00. Costs of OP attendance were not taken into account, as this is part of their education obligations, converted in the work agreement with the OHSs and their contracts with employers. The training costs considered a course delivered to 10 OPs, therefore these costs were divided by two for the five OPs participating in our trial. The resulting € 5,000.00 were divided by 125 (n subjects in the intervention group), resulting in an average training cost of € 40.00.

COST-EFFECTIVENESS

Supplement 2 Cost prices used for valuation of resource use in the economic evaluation			
Units [Units of measurement]	Total costs	Mean (total)	Mean Cost price
Health care sector			
<i>Primary care</i>	€ 172,442.00		
GP consultation worker [No.]	€ 31,068.00	3.5 (838)	€ 37.00
Diagnostic tests [No.]	€ 20,862.00	1.2 (285)	€ 73.00
Medications [per medication]	€ 56,806.00	6.8 (1623)	€ 35.00
Allied health professionals [No.]	€ 23,079.00	1.3 (314)	€ 73.50
Multidisciplinary physical therapy center	€ 35,451.00	0.1 (15)	€ 2363.40
<i>Occupational health care</i>	€ 124,900.00		
OP consultation worker [No.]	€ 64,750.00	3.9 (925)	€ 70.00 ‡
OP contact employer [No.]	€ 6,250.00	1.0 (250)	€ 25.00 ‡
OP contact curative care [No.]	€ 2,500.00	0.4 (100)	€ 25.00 ‡
Contact case manager worker [No.]	€ 16,785.00	1.6 (353)	€ 45.00 ‡
Contact case manager employer [No.]	€ 2,485.00	0.6 (142)	€ 17.50 ‡
Contact case manager curative care [No.]	€ 122.50	0.0 (7)	€ 17.50 ‡
Administrative contact worker [No.]	€ 80.00	0.0 (8)	€ 10.00 ‡
Company Social worker [No. of sessions]	€ 26,928.00	0.4 (99)	€ 68.00 ‡
<i>Psychological treatment</i>	€ 208,654.00		
Psychological treatment paid by community	€ 196,870.00	0.7 (147)	€ 1361.00
Psychological treatment paid by employer	€ 11,784.00	0.1 (16)	€ 77/125 *
<i>Hospital</i>	€ 67,286.00		
Medical specialist [No. of consultations]	€ 10,319.00	0.8 (194)	€ 52.00
Medical operations [No.]	€ 16,259.00	0.1 (32)	€ 508.00
Hospitalization [No. of days]	€ 40,707.00	0.2 (54)	€ 754.00
Productivity losses			
Sick leave per paid work [per day] hca gross	€ 4,442,152.00	148 (240)	€ 124.73 ¶
Sick leave per paid work [per day] hca net	€ 3,397,554.00		
Sick leave per paid work [per day] fcm net	€ 3,284,745.00		
Intervention costs			
Training costs for MISS [per MISS subject]	€ 5,000.00	0.5 (125)	€ 40.00 **

Cost price sources: * Dutch Manual for Costing; ‡ Respective providers or professional organizations; ¶ Mean average gross salary participants, converted to per day cost price assuming a 36-hour work week; ** Determined via a bottom-up calculation.

COST-EFFECTIVENESS

Supplement 3 Means and standard deviations (S.D.) of resource use and utilization (n) group						
Units [Units of measurement]	GBC			UC		
Health care sector	Mean	S.D.	n	Mean	S.D.	n
Primary care						
GP consultation employee [No.]	3.9	2.9	110	4.0	2.5	103
Diagnostic tests (GP-practice/hospital) [No.]	3.0*	2.6	53	2.2*	1.5	58
Medications [per medication]	7.5	7.0	107	9.1	9.6	90
Physical therapist/Allied health professionals			35			36
Multidisciplinary physical therapy center			12			5
Occupational health care						
OP consultation employee [No.]	4.0	2.5	123	4.0	2.4	110
OP contact employer [No.]	2.2	1.4	61	2.0	1.3	58
OP contact curative care [No.]	1.6	0.9	33	1.8	1.0	27
Contact case manager employee [No.]	2.5	1.5	79	2.3	1.4	76
Contact case manager employer [No.]	1.6	0.7	44	1.5	0.8	47
Contact case manager curative care [No.]	1.0	-	1	1.2	0.4	5
Company Social worker [No. of sessions]	4		56	4		43
Psychological treatment						
Psychological treatment paid by employer			47*			107*
Psychological treatment paid by community	8		12*	8		4*
Hospital						
Medical specialist [No. of consultations]	2.8	1.7	30	2.6	1.7	42
Medical operations [No.]	1.4	1.0	10	1.4	1.0	13
Hospitalization [No. of days]	1.8	1.0	11	2.8	2.3	12
Productivity losses						
	Mean	S.D.	n	Mean	S.D.	n
Net days of sick leave HCA	113.2	82.6	125	113.9	87.3	115
Gross days of sick leave HCA	150.7	97.1	125	146.9	102.4	115

* Significant difference between groups (t-test) for $p < 0.05$